

### AMENDMENTS TO THE CLAIMS

1. (Currently amended) A proteorhodopsin gene ~~comprising an isolated from DNA sequence for~~ a naturally occurring marine gamma-proteobacterium of Sequence ID No:1, said proteorhodopsin gene encoding a proteorhodopsin protein having a secondary structure of seven transmembrane  $\alpha$ -helices that form a pocket in which retinal is covalently linked.  
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2. (Currently amended) ~~The A~~ proteorhodopsin gene of claim 1, ~~wherein said proteorhodopsin gene is retrieved from a genomic fragment of a sample of naturally occurring bacteria, marine proteobacteria, gamma-proteobacteria, SAR86 bacteria,~~  
10 recombinant DNA libraries containing said naturally occurring bacteria, or bacterial artificial chromosome libraries containing said naturally occurring bacteria, said proteorhodopsin gene encoding a proteorhodopsin protein having a secondary structure of seven transmembrane  $\alpha$ -helices that form a pocket in which retinal is covalently linked.  
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3. (Currently amended) The proteorhodopsin gene of claim 2, wherein said ~~naturally occurring bacteria are marine proteobacteria~~ genomic fragment is retrieved from a BAC clone BAC31A8 of Sequence ID No:1.
- 20 4. (Currently amended) The proteorhodopsin gene of claim 2, wherein said ~~naturally occurring bacteria are SAR86 bacteria~~ proteorhodopsin gene is Sequence ID No:6 and said proteorhodopsin protein is Sequence ID No:7.
- 25 5. (Currently amended) The proteorhodopsin gene of claim ~~2-37~~, wherein said ~~naturally occurring bacterial genomic fragment is retrieved from a recombinant DNA library~~ proteorhodopsin-specific primers include three nucleotides encoding a non-native amino acid, creating a new restriction endonuclease site not present in the native

sequence of said proteorhodopsin gene, thereby allowing subcloning of said proteorhodopsin gene in an expression vector.

- 5 6. (Currently amended) The proteorhodopsin gene of claim ~~5-41~~, wherein said ~~naturally occurring bacterial genomic fragment is retrieved from a bacterial artificial chromosome library~~ bacterium is *E. coli*.
- 10 7. (Original) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone BAC31A8, said proteorhodopsin gene is Sequence ID No:4 and said proteorhodopsin protein is Sequence ID No:5.
- 15 8. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone BAC40E8, said proteorhodopsin gene is Sequence ID No:8 and said proteorhodopsin protein is Sequence ID No:9.
9. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone BAC41B4, said proteorhodopsin gene is Sequence ID No:10 and said proteorhodopsin protein is Sequence ID No:11.
- 20 10. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone BAC64A5, said proteorhodopsin gene is Sequence ID No:12 and said proteorhodopsin protein is Sequence ID No:13.
- 25 11. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone HOT0m1, said proteorhodopsin gene is Sequence ID No:14 and said proteorhodopsin protein is Sequence ID No:15.
- 30 12. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone HOT75m1, said proteorhodopsin gene is Sequence ID No:16 and said proteorhodopsin protein is Sequence ID No:17.

13. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone HOT75m3, said proteorhodopsin gene is Sequence ID No:18 and said proteorhodopsin protein is Sequence ID No:19.
- 5 14. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone HOT75m4, said proteorhodopsin gene is Sequence ID No:20 and said proteorhodopsin protein is Sequence ID No:21.
- 10 15. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone HOT75m8, said proteorhodopsin gene is Sequence ID No:22 and said proteorhodopsin protein is Sequence ID No:23.
- 15 16. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB0m1, said proteorhodopsin gene is Sequence ID No:24 and said proteorhodopsin protein is Sequence ID No:25.
- 20 17. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB0m2, said proteorhodopsin gene is Sequence ID No:26 and said proteorhodopsin protein is Sequence ID No:27.
- 25 18. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB20m2, said proteorhodopsin gene is Sequence ID No:28 and said proteorhodopsin protein is Sequence ID No:29.
- 30 19. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB20m5, said proteorhodopsin gene is Sequence ID No:30 and said proteorhodopsin protein is Sequence ID No:31.
20. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB20m12, said proteorhodopsin gene is Sequence ID No:32 and said proteorhodopsin protein is Sequence ID No:33.

21. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB40m1, said proteorhodopsin gene is Sequence ID No:34 and said proteorhodopsin protein is Sequence ID No:35.
- 5 22. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB40m5, said proteorhodopsin gene is Sequence ID No:36 and said proteorhodopsin protein is Sequence ID No:37.
- 10 23. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB40m12, said proteorhodopsin gene is Sequence ID No:38 and said proteorhodopsin protein is Sequence ID No:39.
- 15 24. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB100m5, said proteorhodopsin gene is Sequence ID No:40 and said proteorhodopsin protein is Sequence ID No:41.
- 20 25. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB100m7, said proteorhodopsin gene is Sequence ID No:42 and said proteorhodopsin protein is Sequence ID No:43.
- 25 26. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB100m9, said proteorhodopsin gene is Sequence ID No:44 and said proteorhodopsin protein is Sequence ID No:45.
27. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB100m10, said proteorhodopsin gene is Sequence ID No:46 and said proteorhodopsin protein is Sequence ID No:47.

28. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone PALB1, said proteorhodopsin gene is Sequence ID No:48 and said proteorhodopsin protein is Sequence ID No:49.
- 5 29. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone PALB2, said proteorhodopsin gene is Sequence ID No:50 and said proteorhodopsin protein is Sequence ID No:51.
- 10 30. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone PALB5, said proteorhodopsin gene is Sequence ID No:52 and said proteorhodopsin protein is Sequence ID No:53.
- 15 31. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone PALB7, said proteorhodopsin gene is Sequence ID No:54 and said proteorhodopsin protein is Sequence ID No:55.
- 20 32. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone PALB6, said proteorhodopsin gene is Sequence ID No:56 and said proteorhodopsin protein is Sequence ID No:57.
33. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone PALB8, said proteorhodopsin gene is Sequence ID No:58 and said proteorhodopsin protein is Sequence ID No:59.
- 25 34. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone PALE1, said proteorhodopsin gene is Sequence ID No:60 and said proteorhodopsin protein is Sequence ID No:61.
- 30 35. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone PALE6, said proteorhodopsin gene is Sequence ID No:62 and said proteorhodopsin protein is Sequence ID No:63.

36. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone PALE7, said proteorhodopsin gene is Sequence ID No:64 and said proteorhodopsin protein is Sequence ID No:65.

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37. (Currently amended) The proteorhodopsin gene of claim 1 or 2, ~~wherein said proteorhodopsin gene is amplified from a said genomic fragment by polymerase chain reaction utilizing proteorhodopsin-specific primers.~~

10 38. (Currently amended) The proteorhodopsin gene of claim 37, wherein said ~~polymerase chain reaction is performed by proteorhodopsin-specific primers with are~~ Sequence ID No:2 and Sequence ID No:3.

15 39. (Currently amended) The proteorhodopsin gene of claim ~~1-5~~, wherein said ~~proteorhodopsin gene is derived from a marine environment and placed in an expression vector for producing~~ containing said proteorhodopsin gene expresses said proteorhodopsin protein in a host.

20 40. (Original) The proteorhodopsin gene of claim 39, wherein said host is an artificial membrane system.

41. (Original) The proteorhodopsin gene of claim 39, wherein said host is a bacterium.

25 42. (Original) The proteorhodopsin gene of claim 41, wherein said host is a cell membrane preparation of said bacterium.

43. (Original) The proteorhodopsin gene of claim 39, wherein said host is an eukaryote.

30 44. (Original) The proteorhodopsin gene of claim 43, wherein said host is a cell membrane preparation of said eukaryote.

Clams 45-129 (Cancelled).